



CDC Cooperative Agreement

Developing Public Health Capacity and Adaptations
to Reduce Human Health Effects of Climate Change

San Francisco's climate and health program: Progress and lessons learned



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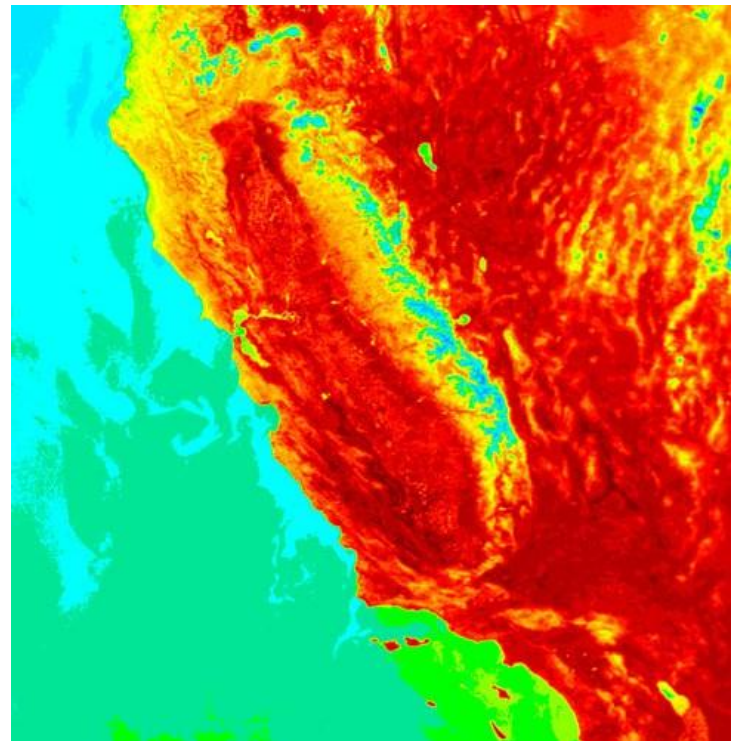
Goal of Partnership with CDC

Develop local public health capacity and adaptations to reduce human health effects from extreme heat events and associated air quality impacts.



Why San Francisco?

San Francisco showed specific vulnerabilities during the 2006 California heat wave, due to our lack of physiologic and technologic adaptations for extreme heat events

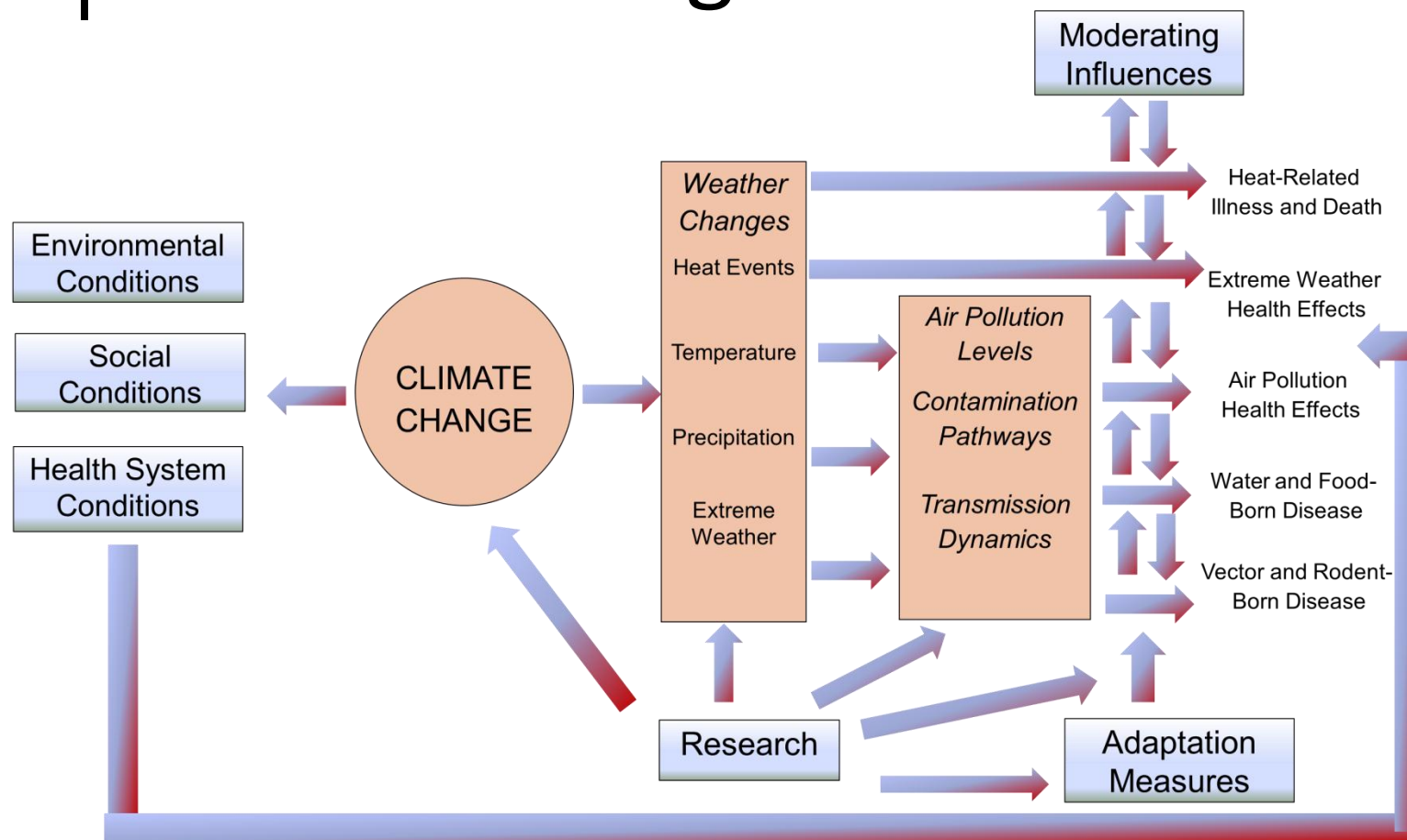




Timeline and Anticipated Outcomes

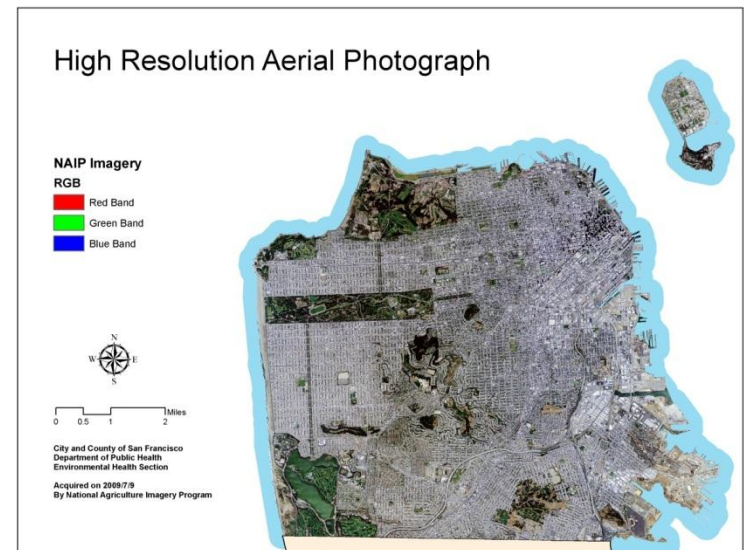
- Year 1
 - Create a Heat Vulnerability Spatial Index
 - Establish Foundation for Inter-Agency Task Force
 - Perform Gap Analysis
 - Develop Environmental Health Indicators for Climate Change
- Year 2
 - Convene Inter-Agency Task Force on a regular basis
 - Create Citywide Strategic Plan for Extreme Heat Events
 - Work with Community Partners & Collaborators
 - Further Validation of Heat Vulnerability Spatial Index
- Year 3
 - Complete Citywide Strategic Plan
 - Work with Community Partners & Collaborators to promote plan

Potential Health Effects of Climate Change



Heat Vulnerability Spatial Index

- Combined a social vulnerability assessment, built environmental attributes and land surface temperature using remote sensed data to understand the intra-urban variations of risk to extreme heat events in San Francisco





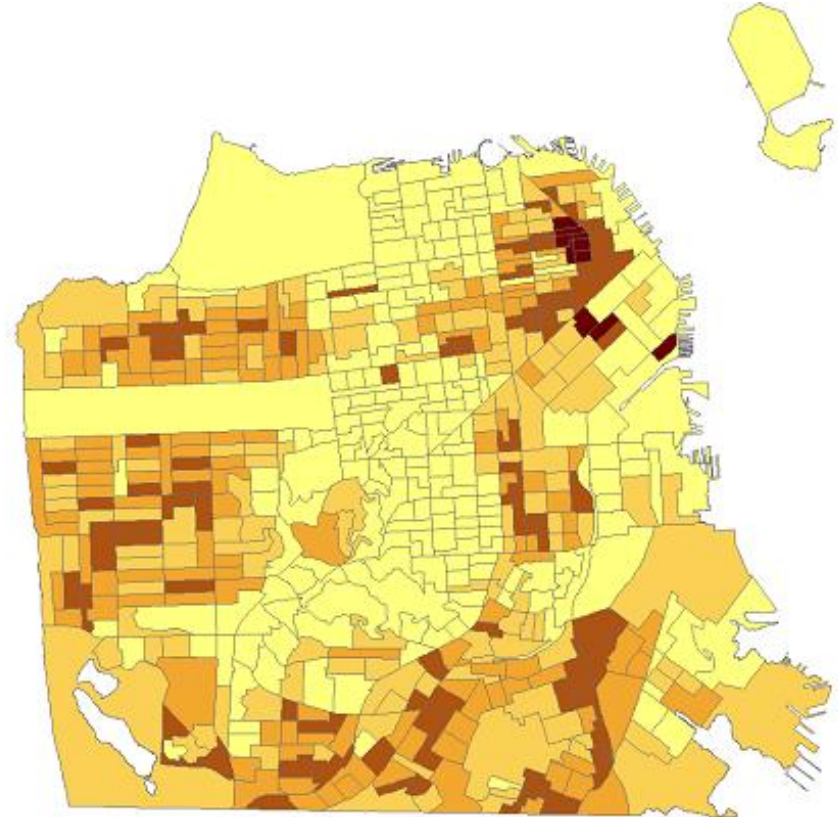
Data on Vulnerability Indicators

| Socioeconomic | Built Environment | Surface Temperature |
|--|---|---|
| Population Density Employment Density Social Isolation Age (Young & Elderly) Race Educational Attainment Language Barriers Income Poverty Asthma Hospitalizations Living on the top floor Living in a Nursing homes | Land Cover Tree Density Building Stock Air Condition Prevalence Air Quality Transportation Access Park Access | Thermal Satellite Imagery Air temperature Normalized Difference Vegetation Index (NDVI) Elevation Distance to Open Water PM2.5 Emission |

Socioeconomic Data

Percent of Linguistically Isolated Households

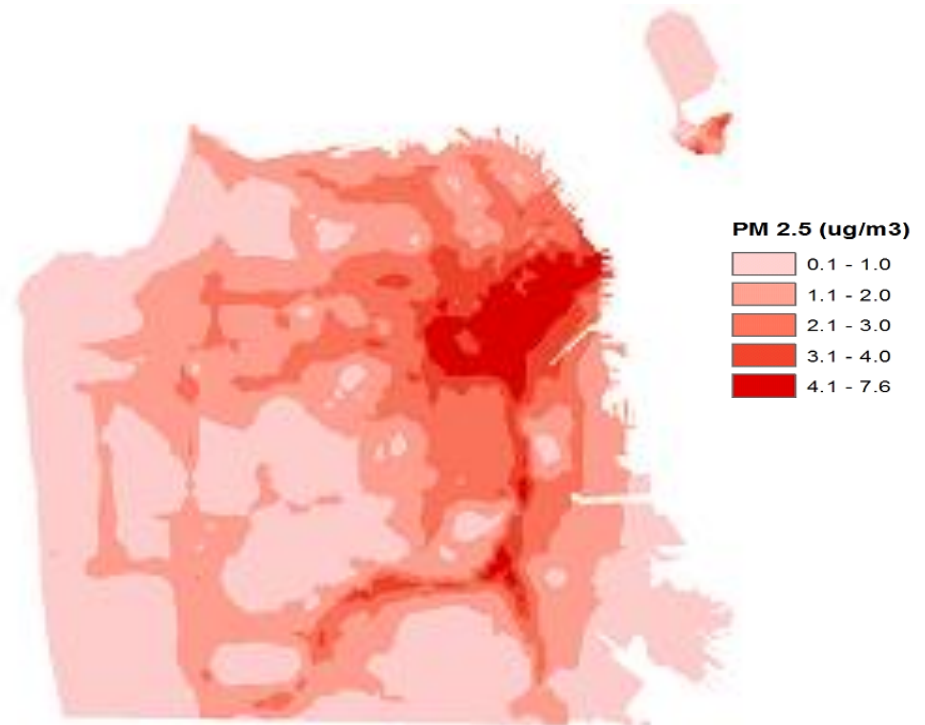
- A linguistically isolated household was one in which all adults had some limitation in communicating English – different forms of isolation represent significant number of those who died during the past extreme heat events



Built Environment

- Heat waves exacerbate air quality conditions, and can threaten the health of populations by increasing people's exposure to air pollution

PM2.5 Emissions Attributable to Traffic Volume

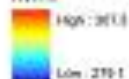


Surface Temperature

2008/5/12 Surface Temperature Map

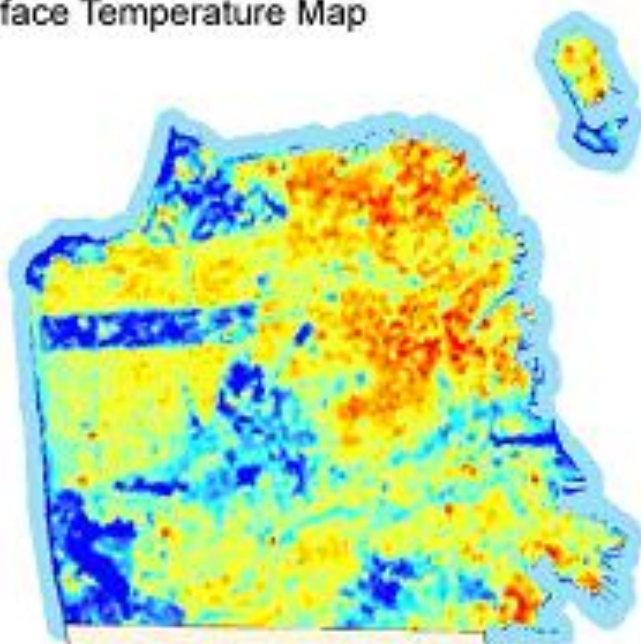
Surface Temperature

Kelvin



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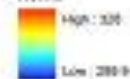
2008/5/12
TM image
Acquired by MODIS
Processed by NOAA



2008/9/1 Surface Temperature Map

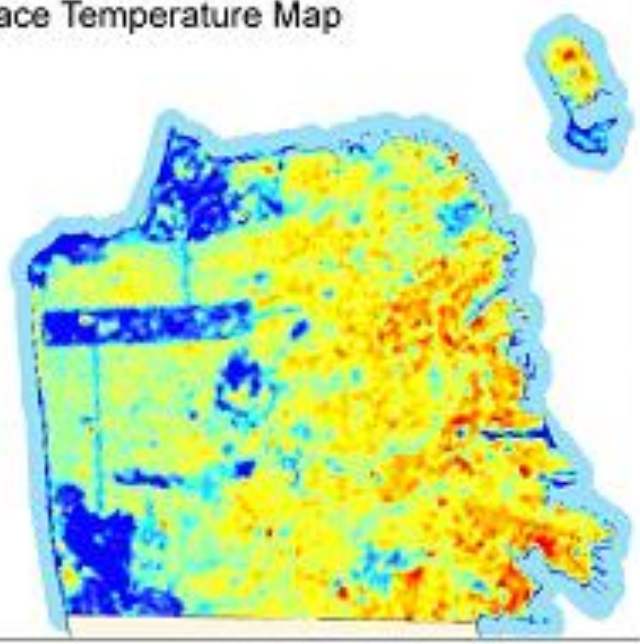
Surface Temperature

Kelvin



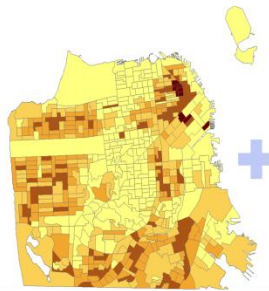
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2008/9/1
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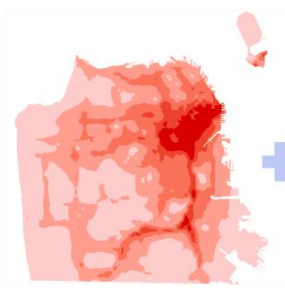


Methods

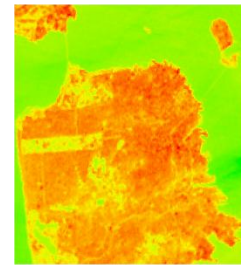
- Mapped each variable corresponding to increasing vulnerability and analyzed data.
- The standardized z-scores for each variable were aggregated and the final index was created using principle component analysis and factor scoring.



Linguistically Isolated



PM2.5 Emissions



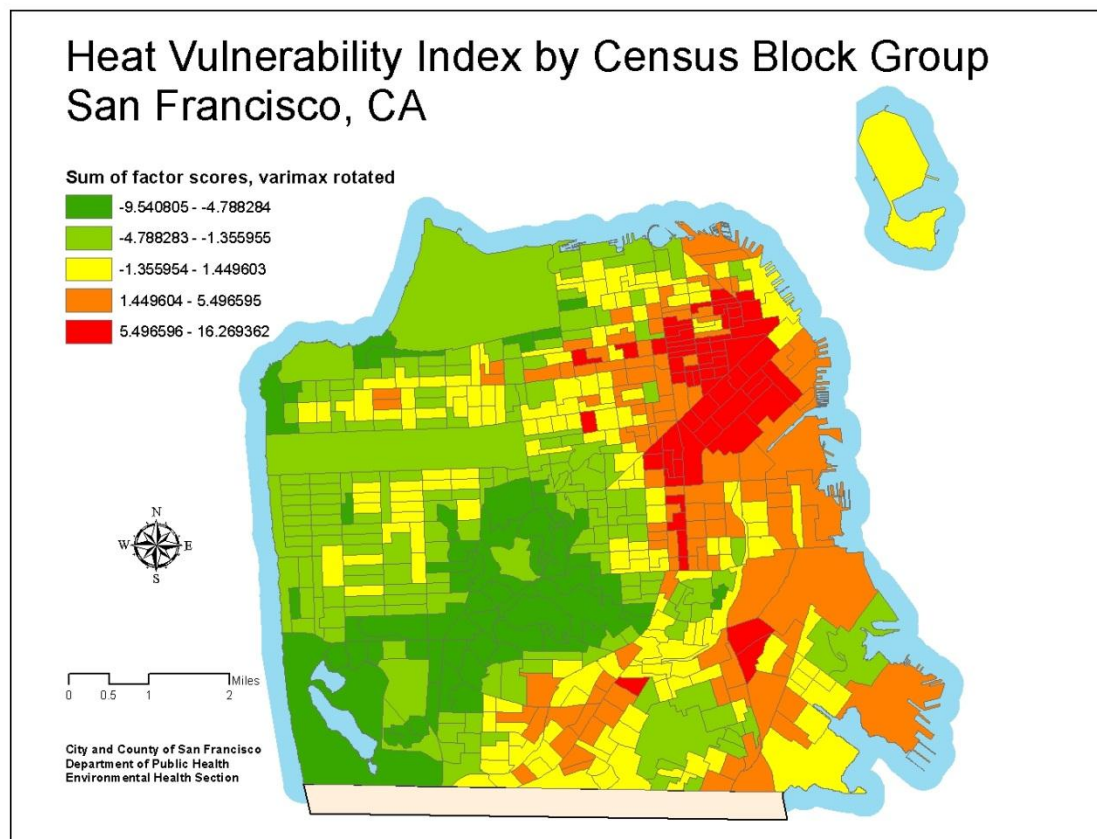
Thermal Satellite Imagery



Results

- The factor scores for the rotated principle component analysis were assigned to each block group and equally weighted.
- Six factor scores were summed for each block group to create the heat vulnerability index. The index was mapped using GIS to visualize the geographic distribution of heat vulnerability within San Francisco (next slide).

Heat Vulnerability Index - Varimax rotated factor scores





Results

- Certain neighborhoods of San Francisco have significantly higher risk during an extreme heat event than others, due to a number of factors including the physical makeup of the landscape and buildings of the neighborhood, and the age, socioeconomic status, and isolation of the people who reside there.
- These neighborhoods include Chinatown, Parts of Downtown Civic Center, Bayview, and Outer Mission, South of Market, Tenderloin and Western Addition.



Gap Analysis

- Based on the Heat Vulnerability Spatial Index we examined neighborhoods and populations at greatest risk of heat wave health impacts and used
- The National Environmental Public Health Performance Standards (NEPHPS) self-assessment instrument and the Ten Essential Services of Public Health

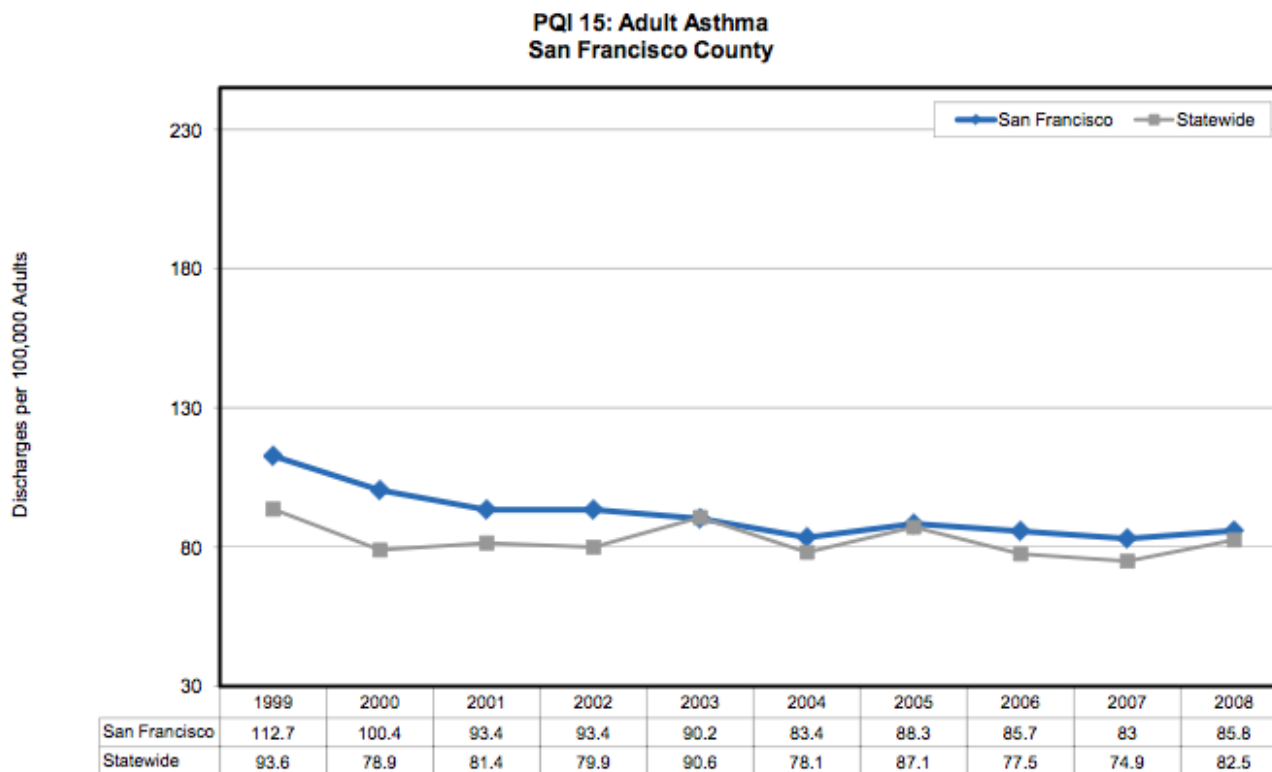


Findings

- Earthquakes have made our disaster planning systems strong.
- The biggest challenge to capacity-building is understanding why climate change and heat matters.
- We know a lot, but less is codified and no formal protocols when it comes to heat.
- Information specific to heat and the public's health is usually missing, partial, or outdated.
- Medical Surge Capacity is a major issue

Climate and Health Indicators

Indicator 11: Allergic Disease Related to Climate Change





Other work products

- Assessing the Health Co-benefits of San Francisco's Climate Action Plan.
- National Presentations
- Integration into City-wide and Regional Planning Process
- Outreach and Training Curriculum



Recommendations

- The identification of vulnerable block groups can aid public health planning efforts to:
 - Work with the most vulnerable communities to reduce the health disparities associated with environmental exposures
 - Identify one cooling center of adequate size for each of the highest-risk neighborhoods and determination of at least one suitable large congregate cooling venue
 - Promote Education, Engage Community Partners and Promote Collaboration



Recommendations

- Identification of the lead agency during an extreme heat event.
- Identification of all of the stakeholders and City Departments/Agencies who have a role in extreme heat event planning and/or response.
- Establish Triggers and thresholds.
- Update the Health Crisis and Risk Communications Plan.
- Work on this project is scalable to other city wide climate projects



In closing. . .

- The largest contributor to relative heat vulnerability in San Francisco is socioeconomic factors which influence a person's ability to prepare and respond to an extreme heat event. Protecting human health and safety during a heat wave will require ensuring emergency preparedness efforts reach those populations most at risk.
- Public health has an important role to play in helping to achieve climate and sustainability goals